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The approach of the transport & logistics cluster model development

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Abstract. The Russian transport system is in seriously need of renovation and improvement its competitiveness in the international logistics area. In this article it is proposed one of the potential variant of solving this challenging task – it is a creation of transport&logistics cluster. Transport&logistics cluster is a new organizational form, which purpose will be to increase not only the quality of transport services, but also the maximization of the effectiveness of the activities of all the participants in the association.

1. Introduction

According to the statistical research attempted by The World Bank the Russian Federation has been rated at the 95 position within 155 the participants in the ranking of competitiveness of transport sector. The rating has been held by using integrated scores of different components like: logistic infrastructure, equipment, customs inspection, road condition and so on [1].

The Ministry of Transport has announced that transportation costs of the country is approximately 15-20% of products cost against 7-8% in developed countries [2]. Transport expenses of the Russian Federation as a global participant in the logistics market are quite impressive figures, which do not allow the country to be competitive in comparison with other participants, both on national market and on the external one. The trend is that the cost of transportation does not go down and the government set the task making the components of the transport chain more efficient.

The transport strategy of the Russian Federation for the period up to 2030 sets the main goal of increasing global competitiveness, which encompasses the markets for goods, services and capital.

2. The goal of the research and its tasks

The goal of the research is to justify development of innovative transport&logistics cluster, which would allow to significantly increase transport productivity indicators and reduce extra costs.

The tasks solved in the research:

- describing the potential structure of such type complex system and its workflow;
- determining technological equipment of transport&logistics cluster to further analyze of warehouse capacity and facilities;
- evaluating the possible economic effect of cluster creation.



3. Solution of the research tasks

However, the formation of such an innovative facility is a non-trivial task. The difficulty lies precisely in the fact that all participants of transport&logistics cluster are heterogeneous in their structure and their final product/ service lies in different planes. However, at the same time, the synergistic effect, which so far can be assumed so far, theoretically or experimentally, is a good enough ground for further research.

Transport& logistics cluster is defined as a group of geographically localized interrelated companies specializing in the storage, escorting and delivery of cargo and passengers, as well as organizations serving infrastructure facilities and other organizations that complement each other and enhance the strengths of each other and realize the competitive advantages of a particular territory [3].

Approximate structure of transport and logistics cluster is shown below:

- firms - intermediaries of transport and logistics activities: warehouse subsystem; subsystem of management; subsystems of insurance and protection of material flow;
- a transport subsystem including carriers and transport infrastructure;
- scientific and technical and personnel support;
- subsystem of information support.

The suggested simple structure of transport&logistics cluster can be represented in the following form (figure 1):

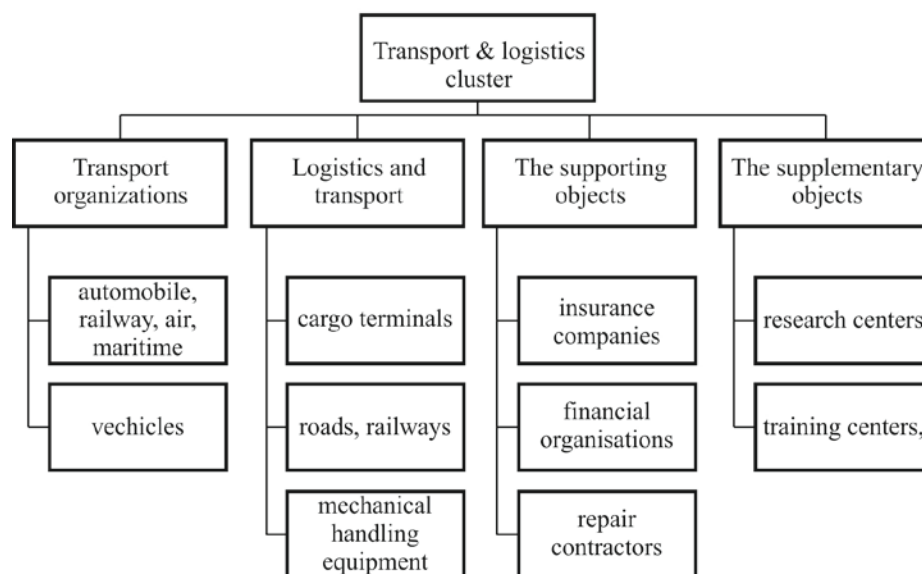


Figure 1. The scenario of transport & logistics cluster model.

The author [4] of the article indicates that clusters are agglomerations of several types of firms and operations: firms providing logistics services, the logistics operations of industrial firms the operations of companies for whom logistics is a large part of their business. Also the research paper [5] notes that logistic clusters are relevant, because they offer: 1) a way for further agglomeration into logistics parks; 2) the right conditions for labor market pooling, better access to specialized skills, and better on-the-job training.

In the other investigation [6] it has been highlighted, that preparation of logistics clusters development strategy must be connected with the transport terminals and logistics clusters optimization layout because it is a common part of an integrated national transport and self-spatial task.

The Russian researchers [7] propose creation of clusters throughout the country, for example, focusing on the proximity to international transport corridors throughout the country, for example, focusing on the proximity of the location to international transport corridors.

The technological equipment of transport&logistics cluster depends on the method of delivery, the cargo itself and other requirements (Tab. 1):

Table 1. Technological equipment of transport&logistics cluster.

The type of transport	The characteristic of transport	Type of object of arrival / storage / departure of cargo	Technological equipment of the object	Note
Railway	Locomotives with covered wagons, platforms and semi-trailers; container- trains	Stations: sorting; district police; docking; border	- Sorting conveyor systems; - Auto- and electric loaders;	Statistic research of railway infrastructure development attempted by the World Bank reports in 2015 - 4.3 points out of 7, 24th place in the ranking [8]. In 2015, the Ministry of Transport issued an order banning the operation of wagons of above-normal duration - in order to reduce the surplus of wagons and encourage market participants to acquire new ones.
		Cargo terminals	- Cranes; - Electric and forklift trucks; - Rail trolley; - Load-gripping devices;	
		Container terminal	- Cranes (gantry, bridge, railway, boom, portal pneumowheel); - Forklift trucks (container forklift trucks with forklift, lateral spreader gripper, reach stackers, portal forklift trucks PAP); - Load-gripping devices	
Aircraft	Freight aircraft	Freight terminals	- Hoists; - Electric trucks; - Mobile conveyors	Equipped with 72% foreign aircraft, 28% - domestic. On the development of infrastructure - 4.1 points, 77 in the ranking [8]. Leasing IL-96 is 500 thousand dollars a month, American "Boeing" - 200 thousand dollars a month.
River / Sea	Container ships	River ports: - load, freight terminals	- Portal cranes; - Load-lifting devices; - Conveyors; - Rail trolleys	The development of infrastructure - 3.9 points, 75th place in the ranking [8]. The age structure of the internal river fleet according to 2013 data is 57.9% over 30 years.
		Marine terminals	- Bridge mooring re-loader; - Cranes (ship portal-boom, mobile trackless boom); - Raid tugs; - Loaders; - Terminal tractors with semi-trailers; - Transport robots	
Automobile	Caravans; Tent cars; Tractors	Cargo terminals	- electric and forklift trucks; - load-lifting devices; - belt or roller conveyor	On the development of infrastructure - 2.7 points, 123 in the ranking [8]. The "Platon" system will also be a factor in increasing the costs of carriers, which will undoubtedly affect consumers.

To summarize information given in the table it must be highlighted that transport infrastructure needs updating, so not only budget resources can be invested, but also private investment of cluster members.

The activity of transport&logistics cluster itself can be described as follows, (figure 2):

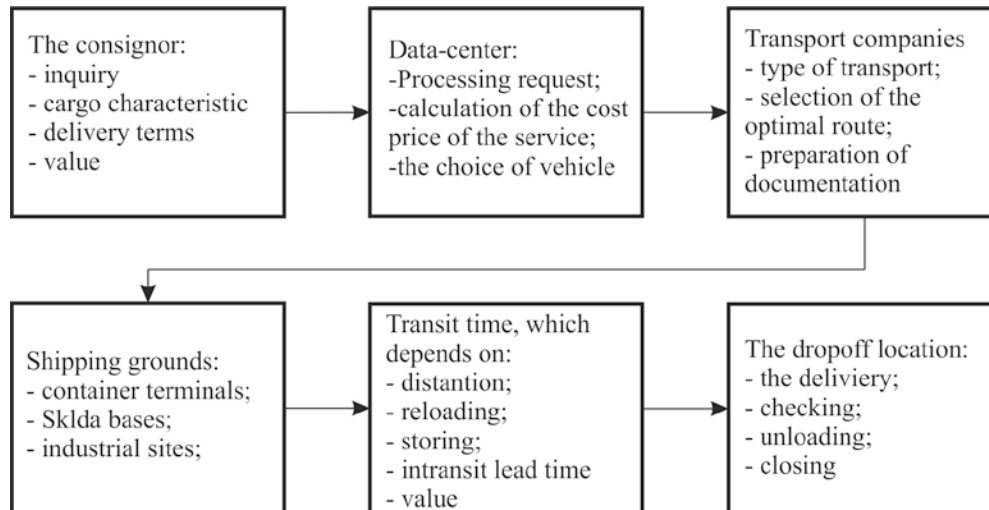


Figure 2. The example of transport & logistics cluster workflow.

The main idea of development such type complex system is to reach two business proposes: to do a business just in time and to decrease cost price of services, or the other words to decrease transaction expenses.

To evaluate the effectiveness of TLC it can be suggested the common mathematical equation:

$$TLC = f(Z, S, T, M, C) \rightarrow \min; \quad (1)$$

where Z – common transport and logistics expenses; S – warehouse stock; T – transit time; M – marketing constituent; C – expenses of the TLC members.

The hypothesis advanced by the author [9] concludes that it will be decreasing of transaction costs of almost cluster members.

The cumulative effect of creating a TLC in the general mathematical case can be expressed by the following formula:

$$\Delta = \Delta Z + \Delta S + \Delta T + \Delta M + \Delta C; \quad (2)$$

where Δ - the total savings of cluster; ΔZ – the transport and logistics savings; ΔS – the savings of warehouse stock; ΔM - the savings of marketing expenses; ΔC – the savings of other operations (non logistic and transport).

It can be described by the following reasons:

1. A common information field, namely, there is no need to find the right intermediary, partner, counterparty - because all members of the cluster are sufficient to conduct an effective activity;
2. Partnership relations presuppose a flexible pricing policy between the cluster members, no one canceled the competition, but the sustainable development of all cluster members is a priority. What gives greater stability to the cluster as a system?
3. A well-established system, prescribed procedures, will allow to shorten the time of delivery of goods in case of complex or combined shipment, in view of the fact that the participants of the cluster, namely the freight / expedition companies, have already established a workflow.

The integrated work of complex system will lead to the conclusion that having common resources, all the necessary information, using jointly the material and technical base, and also creating standardized work processes, such an innovative format of the organization will allow to reduce transaction costs (figure 3).

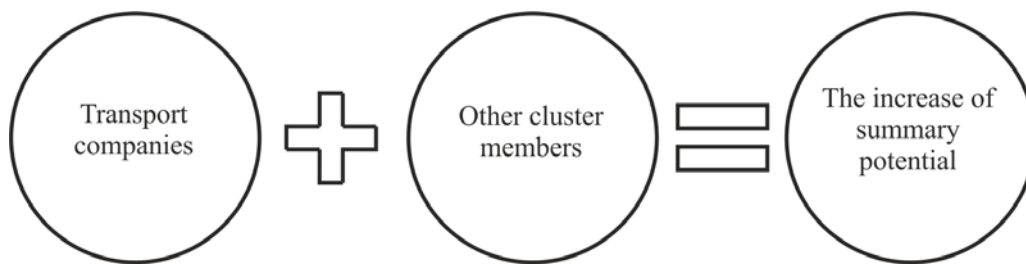


Figure 3. The cumulative effect of integrated activities.

The summary effect of general operations of each participant in the cluster is greater than the sum of the effect of the participant who is not a member of the cluster. In other words, joint work allows reducing such costs as:

- Development of own standards for the regulation of activities, which will allow to unify the working procedures, and thus to achieve a quality work;
- All participants of the cluster will work in a single information field, which means that they will have access to all necessary information within the cluster structure.

4. Conclusion

Based on the obtained results in this article and theoretical studies of other authors [3, 5], it can be assumed that the innovative form of cluster will have development perspective and the overall effect of the joint activities of each cluster participants will be positive rather than failure.

Reducing transaction costs as a result of collaborative activities of all cluster participants is a positive measure, which will be a competitive advantage and can be used as an operational leverage.

Thus, further investigations in this field using new technologies like simulation will probably be meaningful as the first approximation to real physical transport systems.

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